

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

294-109 PCT/US

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR

09/936621

INTERNATIONAL APPLICATION NO.
PCT/NL00/00165

INTERNATIONAL FILING DATE
10 March 2000

PRIORITY DATE CLAIMED
15 March 1999

TITLE OF INVENTION
Ingredients for Expanded Foods

APPLICANT(S) FOR DO/EO/US
Ugo SIEPEL and Pieter Lykle BULWALDA

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (24) indicated below.
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
 - a. ☐ is attached hereto (required only if not communicated by the International Bureau).
 - b. ☒ has been communicated by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
 - a. ☐ is attached hereto.
 - b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
 - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
 - b. ☐ have been communicated by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☒ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
10. ☐ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).
11. ☒ A copy of the International Preliminary Examination Report (PCT/ISPEA/409).
12. ☒ A copy of the International Search Report (PCT/ISA/210).

Items 13 to 20 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☐ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
20. ☒ A second copy of the published international application under 35 U.S.C. 154(d)(4).
21. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
22. ☒ Certificate of Mailing by Express Mail
23. ☒ Other items or information:

Note that the IPER includes an annex containing two sheets of amended claims (in English).

EXPRESS MAIL CERTIFICATE

Page 1 of 2

PCTUS1/REV33

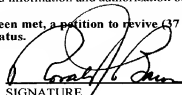
Date: 09/11/01 Label No: EL608284812US

I hereby certify that on the date indicated above, I deposited this paper or few with the U.S. Postal Service and that it was addressed for delivery to the Assistant Commissioner for Patents, Washington, D.C. 20231 by EXPRESS MAIL, Post Office of Addressee's Service.

CASSANDRA LEMS Cassandra Lems

U.S. APPLICATION NO. (IF KNOWN, SEE 1-1) 09/936601		INTERNATIONAL APPLICATION NO. PCT/NL00/00165		ATTORNEY'S DOCKET NUMBER 294-109 PCT/US	
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24. The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) : <input type="checkbox"/> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO \$1000.00 <input checked="" type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$860.00 <input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$710.00 <input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$690.00 <input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00				CALCULATIONS PTO USE ONLY <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">ENTER APPROPRIATE BASIC FEE AMOUNT =</td> <td style="width: 50%; text-align: right;">\$860.00</td> </tr> <tr> <td>Surcharge of \$130.00 for furnishing the oath or declaration later than _____ months from the earliest claimed priority date (37 CFR 1.492 (e)). <input type="checkbox"/> 20 <input type="checkbox"/> 30</td> <td style="text-align: right;">\$0.00</td> </tr> <tr> <td>CLAIMS</td> <td></td> </tr> <tr> <td>NUMBER FILED</td> <td></td> </tr> <tr> <td>NUMBER EXTRA</td> <td></td> </tr> <tr> <td>RATE</td> <td></td> </tr> <tr> <td>Total claims 19 - 20 = 0 x \$18.00</td> <td style="text-align: right;">\$0.00</td> </tr> <tr> <td>Independent claims 4 - 3 = 1 x \$80.00</td> <td style="text-align: right;">\$80.00</td> </tr> <tr> <td>Multiple Dependent Claims (check if applicable) <input checked="" type="checkbox"/></td> <td style="text-align: right;">\$270.00</td> </tr> <tr> <td>TOTAL OF ABOVE CALCULATIONS =</td> <td style="text-align: right;">\$1,210.00</td> </tr> <tr> <td><input type="checkbox"/> Applicant claims small entity status. (See 37 CFR 1.27). The fees indicated above are reduced by 1/2.</td> <td style="text-align: right;">\$0.00</td> </tr> <tr> <td>SUBTOTAL =</td> <td style="text-align: right;">\$1,210.00</td> </tr> <tr> <td>Processing fee of \$130.00 for furnishing the English translation later than _____ months from the earliest claimed priority date (37 CFR 1.492 (f)). <input type="checkbox"/> 20 <input type="checkbox"/> 30 +</td> <td style="text-align: right;">\$0.00</td> </tr> <tr> <td>TOTAL NATIONAL FEE =</td> <td style="text-align: right;">\$1,210.00</td> </tr> <tr> <td>Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). <input type="checkbox"/></td> <td style="text-align: right;">\$0.00</td> </tr> <tr> <td>TOTAL FEES ENCLOSED =</td> <td style="text-align: right;">\$1,210.00</td> </tr> <tr> <td></td> <td> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Amount to be refunded</td> <td style="width: 50%; text-align: right;">\$</td> </tr> <tr> <td>charged</td> <td style="text-align: right;">\$</td> </tr> </table> </td> </tr> </table>		ENTER APPROPRIATE BASIC FEE AMOUNT =	\$860.00	Surcharge of \$130.00 for furnishing the oath or declaration later than _____ months from the earliest claimed priority date (37 CFR 1.492 (e)). <input type="checkbox"/> 20 <input type="checkbox"/> 30	\$0.00	CLAIMS		NUMBER FILED		NUMBER EXTRA		RATE		Total claims 19 - 20 = 0 x \$18.00	\$0.00	Independent claims 4 - 3 = 1 x \$80.00	\$80.00	Multiple Dependent Claims (check if applicable) <input checked="" type="checkbox"/>	\$270.00	TOTAL OF ABOVE CALCULATIONS =	\$1,210.00	<input type="checkbox"/> Applicant claims small entity status. (See 37 CFR 1.27). The fees indicated above are reduced by 1/2.	\$0.00	SUBTOTAL =	\$1,210.00	Processing fee of \$130.00 for furnishing the English translation later than _____ months from the earliest claimed priority date (37 CFR 1.492 (f)). <input type="checkbox"/> 20 <input type="checkbox"/> 30 +	\$0.00	TOTAL NATIONAL FEE =	\$1,210.00	Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). <input type="checkbox"/>	\$0.00	TOTAL FEES ENCLOSED =	\$1,210.00		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Amount to be refunded</td> <td style="width: 50%; text-align: right;">\$</td> </tr> <tr> <td>charged</td> <td style="text-align: right;">\$</td> </tr> </table>	Amount to be refunded	\$	charged	\$
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a. <input checked="" type="checkbox"/> A check in the amount of \$1,210.00 to cover the above fees is enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees. A duplicate copy of this sheet is enclosed. c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 08-2461 . A duplicate copy of this sheet is enclosed. d. <input type="checkbox"/> Fees are to be charged to a credit card. WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.	 SIGNATURE Ronald J. Baron NAME 29,281 REGISTRATION NUMBER 11 September 2001 DATE
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SEND ALL CORRESPONDENCE TO: Ronald J. Baron, Esq. Hoffmann & Baron, LLP 6900 Jericho Turnpike Syosset, New York 11791 United States of America Telephone: 516-822-3550 Facsimile: 516-822-3582	NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.
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In re Application of: Siepel, et al.
Serial No.: 09/936,621
Confirmation No.: 7146
Filed: September 11, 2001
For: Ingredients for Expanded Foods

COMMISSIONER FOR PATENTS
Washington, DC 20231

Sir:

Transmitted herewith is an Amendment in the above-identified application.

- ☐ Small entity status of this application under 37 C.F.R. 1.9 and 1.27 has been established by a verified statement previously submitted.
- ☐ A verified statement to establish small entity status under 37 C.F.R. 1.9 and 1.27 is enclosed.
- ☒ No additional fee is required.

The fee has been calculated as shown below:

	(Col. 1)		(Col. 2)	(Col. 3)
	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
TOTAL	* 18	MINUS	*** 19	= 0
INDEP	* 3	MINUS	*** 4	= 0

SMALL ENTITY

RATE	ADDL. FEE
x 9=	\$
x 42=	\$
x 140=	\$
TOTAL	\$ 0.00

OR

OTHER THAN A
SMALL ENTITY

RATE	ADDL. FEE
x 18=	\$
x 84=	\$
x 280=	\$
TOTAL	\$ 0.00

OR

- ☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIMS

* If the entry in Column 1 is less than the entry in Column 2, write "0" in Column 3
** If the "HIGHEST NUMBER PREVIOUSLY PAID FOR" in this space is less than 20, write "20" in this space
*** If the "HIGHEST NUMBER PREVIOUSLY PAID FOR" in this space is less than 3, write "3" in this space The "HIGHEST NUMBER PREVIOUSLY PAID FOR" (Total or Independent) is the highest number found from the equivalent box in Column 1 of a prior amendment or the number of claims originally filed

- ☐ Please charge my Deposit Account No. 08-2461 in the amount of \$ _____. A duplicate copy of this sheet is attached.
- ☐ A check in the amount of \$ _____ is attached.
- ☒ The Commissioner is hereby authorized to charge any fees or additional fees associated with this communication or credit any overpayment to Deposit Account No. 08-2461. A duplicate copy of this sheet is attached.
- ☒ Any filing fees under 37 C.F.R. 1.16 for the presentation of extra claims.
- ☒ Any patent application processing fees under 37 C.F.R. 1.17.

HOFFMANN & BARON, LLP
6900 Jericho Turnpike
Syosset, NY 11791
(516) 822-3550
SAS/dlb

Respectfully submitted,

Susan A. Sipos
Registration No. 43,128

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JC10 Rec'd PCT/PTO 08 JAN 2002



109976621-011002

Rec'd PCT/PTO 08 JAN 2002

PATENT

#3/a

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Siepel et al.

Examiner: Unassigned

Serial No.: 09/936,621

Group Art Unit: Unassigned

Filed: September 11, 2001

Docket: 294-109 PCT/US

For: INGREDIENTS FOR
EXPANDED FOODS

Date: December 10, 2001

Commissioner for Patents
Washington, DC 20231

I hereby certify this correspondence is being deposited with the United States Postal Service as first class mail, postpaid in an envelope, addressed to:
Assistant Commissioner for Patents, Washington, D.C.

20231 on December 10, 2001Dated: 12/10/01 P. Bayer**PRELIMINARY AMENDMENT**

Sir:

Applicants respectfully submit the following Preliminary Amendment for entry in the above-identified application prior to examination:

IN THE SPECIFICATION:

On page 1, before line 1, after the title, please insert the following:

This application is the U.S. National Phase of International Application Number PCT/NL00/00165 filed on March 10, 2000.

BACKGROUND OF THE INVENTION

On page 3, before line 14, please insert the following:

SUMMARY OF THE INVENTION

The invention provides a method for obtaining an expanded foodstuff having improved expansion characteristics. The method comprises preparing a composition comprising a non-cereal amylopectin starch, wherein said starch has an amylopectin content of at least 90 weight percent based upon dry substance; heating at least part of said

Applicant: Siepel et al.
Serial No.: 09/936,621
Filing Date: September 11, 2001
Docket: 294-109 PCT/US
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composition to a temperature above its glass transition temperature; and letting it cool to a temperature below its glass transition temperature.

DETAILED DESCRIPTION OF THE INVENTION

Please replace lines 10-15, on page 8, with the following:

The invention is further described in the examples therein without limiting the invention.

EXAMPLES

IN THE CLAIMS:

Please amend claims 1, 3, 4, 6-11 and 13-15 as follows:

1. (Amended) A method for obtaining an expanded foodstuff having improved expansion characteristics, comprising:
 - i) preparing a composition comprising a non-cereal amylopectin starch, wherein said starch has an amylopectin content of at least 90 weight percent based upon dry substance;
 - ii) heating at least part of said composition to a temperature above the glass transition temperature of said composition; and
 - iii) cooling said part of composition to a temperature below said glass transition temperature of said composition,wherein said expanded foodstuff comprises said composition, and wherein said expanded foodstuff is obtained.
2. A method according to claim 1 wherein said composition is a dough.

3. (Amended) A method according to claim 1, wherein said starch is derived from a potato.

4. (Amended) A composition for preparing an expanded foodstuff, wherein said composition comprises a non-cereal amylopectin starch.

5. A composition according to claim 4, wherein said starch has an amylopectin content of at least 95 weight percent based on dry substance.

6. (Amended) A composition according to claim 4, wherein said starch is derived from a potato.

7. (Amended) A composition according to claim 4, wherein said starch is cross-linked.

8. (Amended) A composition according to claim 4, wherein said starch is stabilized.

9. (Amended) An expanded foodstuff comprising a non-cereal amylopectin starch.

10. (Amended) An expanded foodstuff according to claim 9, wherein said starch has an amylopectin content of at least 95 weight percent based on dry substance.

11. (Amended) An expanded foodstuff according to claim 9, wherein said starch is derived from a potato.

Please cancel claim 12.

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 Serial No.: 09/936,621
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13. (Amended) A method according to claim 1, wherein said starch is modified.

14. (Amended) A method according to claim 1, wherein said foodstuff is a snack.

15. (Amended) A method according to claim 1, wherein said foodstuff comprises a coating.

AFTER THE CLAIMS:

Please insert, after the claims, on a separate sheet:

ABSTRACT

The invention relates to a composition for use in preparing an expanded foodstuff such as snacks, said composition comprising at least a non-cereal amylopectin starch. It is a further object of the present invention to provide a method for obtaining an expanded foodstuff having improved expansion characteristics. Said composition, such as dough, at least comprising a non-cereal amylopectin starch, such as that isolated from potato tubers or tapioca. The preparation is carried out by heating at least part of the composition to a temperature above its glass transition temperature and letting it cool to below said glass transition temperature.

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Filing Date: September 11, 2001
Docket: 294-109 PCT/US
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REMARKS

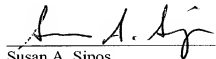
Applicants have amended claims 1, 3, 4, 6-11 and 13-15, and cancelled claim 12 in the above-identified application in order to remove improper multiple dependencies and conform to U.S. practice. Accordingly, claims 1-11 and 13-15 are pending. No new matter has been added.

In addition, headings and an abstract have been added to the specification. A copy of the Abstract is attached hereto on a separate sheet for the convenience of the Examiner.

Entry hereof and examination on the merits are respectfully requested.

It is believed that no fees are due. However, in the event that a fee is due, the Commissioner is hereby authorized to charge any fees or additional fees associated with the communication or credit any over-payment to Deposit Account No. 08-2461. A duplicate copy of this sheet is attached.

Respectfully submitted,



Susan A. Sipos
Registration No.: 43,128
Attorney for Applicants

HOFFMANN & BARON, LLP
6900 Jericho Turnpike
Syosset, New York 11791
(516) 822-3550
SAS/dlb

Applicant: Siepel et al.
Serial No.: 09/936,621
Filing Date: September 11, 2001
Docket: 294-109 PCT/US
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VERSION OF AMENDMENT WITH MARKS
TO SHOW CHANGES MADE

IN THE SPECIFICATION:

On page 1, before line 1, after the title, please insert the following:

This application is the U.S. National Phase of International Application Number
PCT/NL00/00165 filed on March 10, 2000.

BACKGROUND OF THE INVENTION

On page 3, before line 14, please insert the following:

SUMMARY OF THE INVENTION

The invention provides a method for obtaining an expanded foodstuff having improved expansion characteristics. The method comprises preparing a composition comprising a non-cereal amylopectin starch, wherein said starch has an amylopectin content of at least 90 weight percent based upon dry substance; heating at least part of said composition to a temperature above its glass transition temperature; and letting it cool to a temperature below its glass transition temperature.

DETAILED DESCRIPTION OF THE INVENTION

Please replace lines 10-15, on page 8, with the following:

The invention is further described in the [detailed description and the] examples therein without limiting the invention.

Applicant: Siepel et al.
 Serial No.: 09/936,621
 Filing Date: September 11, 2001
 Docket: 294-109 PCT/US
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EXAMPLES [Detailed description]

IN THE CLAIMS:

Please amend claims 1, 3, 4, 6-11 and 13-15 as follows:

1. (Amended) A method for obtaining an expanded foodstuff having improved expansion characteristics, comprising:
 - i) preparing [the preparation of] a composition [at least] comprising a non-cereal amylopectin starch, wherein said starch has an amylopectin content of at least 90 weight percent based upon dry substance;
 - ii) heating at least part of said composition to a temperature above [its] the glass transition temperature of said composition; and
 - iii) cooling said part of composition [letting it cool to] to a temperature below said glass transition temperature of said composition, wherein said expanded foodstuff comprises said composition, and wherein said expanded foodstuff is obtained.
2. A method according to claim 1 wherein said composition is a dough.
3. (Amended) A method according to [anyone of claims] claim 1 [or 2] wherein said starch is derived from a potato.
4. (Amended) A composition for [use in] preparing an expanded foodstuff, wherein said composition [at least comprising] comprises a non-cereal amylopectin starch.
5. A composition according to claim 4, wherein said starch has an amylopectin content of at least 95 weight percent based on dry substance.

6. (Amended) A composition according to claim 4 [or 5], wherein said starch is derived from a potato.

7. (Amended) A composition according to [anyone of claims] claim 4 [to 6], wherein said starch is cross-linked.

8. (Amended) A composition according to [anyone of claims] claim 4 [to 7], wherein said starch is stabilised.

9. (Amended) An expanded foodstuff [at least] comprising a non-cereal amylopectin starch.

10. (Amended) An expanded foodstuff according to claim 9 [5], wherein said starch has an amylopectin content of at least 95 weight percent based on dry substance.

11. (Amended) An expanded foodstuff according to claim 9 [5 or 10], wherein said starch is derived from a potato.

Please cancel claim 12.

13. (Amended) [Use] A method according to [claim 12] claim 1, wherein said starch is modified.

14. (Amended) [Use] A method according to [claim 12 or 13] claim 1, wherein said foodstuff is a snack.

15. (Amended) [Use] A method according to [anyone of claims 12 to 14] claim 1, wherein said foodstuff comprises a coating.

Applicant: Siepel et al.
Serial No.: 09/936,621
Filing Date: September 11, 2001
Docket: 294-109 PCT/US
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AFTER THE CLAIMS:

Please insert, after the claims, on a separate sheet:

ABSTRACT

The invention relates to a composition for use in preparing an expanded foodstuff such as snacks, said composition comprising at least a non-cereal amylopectin starch. It is a further object of the present invention to provide a method for obtaining an expanded foodstuff having improved expansion characteristics. Said composition, such as dough, at least comprising a non-cereal amylopectin starch, such as that isolated from potato tubers or tapioca. The preparation is carried out by heating at least part of the composition to a temperature above its glass transition temperature and letting it cool to below said glass transition temperature.

Title: Ingredients for expanded foods.

The invention relates to expansion of foodstuff, in particular to the production of expanded food items such as snacks.

Expanded foods are well-known to every consumer. Their highly aerated texture is appreciated in toast, snacks, crackers and a multitude of other products that are often eaten snack wise. In general, expansion of a certain product is achieved by heating a composition such as a dough to a temperature above its glass transition temperature and then expanding it, for example by applying a gas which blows the plasticised mass to a foam. This foam is subsequently brought to below its glass transition temperature whereby the expanded dough settles resulting in a stable, glassy or crispy and expanded foam.

Perhaps the best known example of such an expanded product is popcorn. The corn is heated well above the glass transition temperature of the starch. At this temperature water boils vigorously and the resulting steam blows the corn kernel to a foam (the popping). Since water is a very efficient plasticiser for starches, the release of water results in a sharp increase in the glass transition temperature. As a result the popcorn is frozen into its well-appreciated tender and crispy form.

Apart from flavour, texture is the second most important criterion in determining the acceptability and attractiveness of a food product. For many products the crispiness and extent of expansion mainly govern the sensation of texture. Examples of expanded products are extruded snacks, crackers, cookies, coated nuts, Japanese style snacks, some types of confectionery, dry roasted nuts, chip-like products, etc. In general, such snacks are best appreciated when they are most expanded, i.e. contain the most air and are most brittle. Often such snacks are also described as being light and crispy.

As already mentioned glass transition temperature and the influence of water on this temperature can govern the expansion. All starches have their own typical glass transition

at a fixed moisture content as is described in J.-L. Jane et al, "Effects of starch chemical structures on gelatinisation and pasting properties" in *Zywnosc Technologiczna*, 4(17) 63-71, Cracow 1998. Apart from these factors the viscosity and the visco-elasticity are also important factors in governing the foaming properties of plasticised materials.

Degrees of crispiness and expansion are often achieved by varying process conditions and formula aspects. For example in snack preparations often a mixture of starches, flour and a (most times limited) amount of water is prepared. A process step is carried out such as extrusion, sheeting or coating in order to bring the dry or semi-dry mix, dough or batter into a certain shape or condition. Final process steps can be drying, baking or frying, through which expansion is obtained as described above.

Yet another typical example of expanded foodstuff are puffed snacks. Farinaceous materials are formed into pellets with a distinct shape. Heating the pellets for instance through frying or with a puffing gun results in the desired snack. Also, fabricated corn or potato chips are an important factor in the market. In U.S. Patent 3,576,647 a process is described in which the preparation of chip-like expanded products is described. In U.S. Patent 5,500,240 the application of pregelatinised waxy maize starch for the production of (potato) chip like products is described. The machinability of the transient dough is rather good, resulting in low fat chip-like products. No remarks with respect to expansion are made. However, the application of cereal starches in potato or other non-cereal snacks may lead to off taste products.

For foodstuff, it is in general desirable that a starch be bland or neutral in flavour. The starches generally having the most neutral taste are non-cereal, such as tuber- or root-type, starches, such as potato or tapioca, when compared to starches such as corn, wheat, rice, sorghum, waxy maize and waxy sorghum, which, when incorporated into food, give some undesirable flavour (peculiar to the starch) to the food. These off-flavours have been described by some individuals as 'woody', 'corny', 'starchy', 'bitey' or 'chalkey', and these

flavours often come out most poignant after heat treatment, amongst others because cereal starches contain considerable amounts of lipids and proteins, when compared to non-cereal starches.

It is an object of the present invention to provide expanded foodstuff, and methods of obtaining these, having improved expansion characteristics, containing more air or being even more light and/or crispy over comparable expanded foodstuffs that have been traditionally on the market. It is a further object of the present invention to provide expanded foodstuff wherein the starch used has a unpronounced or neutral taste.

The invention provides a method for obtaining an expanded foodstuff having improved expansion characteristics comprising preparing a composition, such as a dough, coating mix, pre-mix, etc, at least comprising a non-cereal amylopectin starch, heating at least part of said composition to a temperature above its glass transition temperature, i.e. expanding said heated composition and letting it cool to below said glass transition temperature. As referred to herein, non-cereal amylopectin starch is a starch isolated from non-cereals, such as potato tubers or tapioca and having an amylopectin content typically more than 90 wt.%, preferably of at least 95 wt.%, and preferably at least 98 wt.%, or even at least 99 wt.%, based on dry substance.

Due the presence of the non-cereal amylopectin starch, preferably a starch having an amylopectin content of at least 90 weight percent based on dry substance of said starch in said composition, an improved expansion is obtained. In a preferred embodiment, a method according to the invention is provided wherein said starch is derived from a potato.

The invention also provides a composition for use in preparing an expanded foodstuff, said composition at least comprising a non-cereal amylopectin starch. Such a composition is for example a dough, (tempura or fritter) batter, mix or ready-to-use pre-mix to which for example only water need to be added for preparing a dough or batter, said composition

optionally containing other starches, carbohydrates, fats, proteins, flavours, salts, or other food components. In a preferred embodiment a composition according to the invention is provided wherein said non-cereal amylopectine starch has an amylopectin content of at least 90 weight percent based on dry substance. It is preferred that at least 10%, more preferably at least 25% of the starch fraction in said expanded products comprises non-cereal amylopectine starch, be it native non-cereal amylopectin starch or a non-cereal amylopectin starch derivative, to provide for the expansion characteristics desired for the type of expanded food product.

The invention also provides an expanded foodstuff comprising a non-cereal amylopectin starch. Examples of such foodstuff as provided by the invention are extruded snacks, crackers, cookies, doughnuts, chip-like products, Japanese style snacks, some types of confectionery, or coated foodstuff such as coated nuts, dry roasted nuts, fritter or tempura type products, etc., or food coatings, such as snack coatings, bread coatings, French fries coatings, and pre-mixes therefor, comprising a non-cereal amylopectin starch, particularly those comprising starch or starch granules containing more than 90 or 95%, and usually more than 98% of amylopectin.

The present invention in particular relates to expanded products in which amylopectin starch or derivatives thereof are applied as to impart expansion properties. It has been provided by the invention that use of non-cereal amylopectin starch, and non-cereal amylopectin starch derivatives for the preparation of expanded foodstuffs induces unexpected high expansion when compared to other starches. Most starches typically consist of granules in which two types of glucose polymers are present. These are amylose (15-35 wt.% on dry substance) and amylopectin (65-85 wt.% on dry substance). Amylose consists of unbranched or slightly branched molecules having an average degree of polymerisation of 100 to 5000, depending on the starch type. Amylopectin consists of very large, highly branched molecules having an average degree of polymerisation of 1,000,000 or more. The commercially most important starch types (maize starch, potato starch, wheat starch and tapioca starch) contain 15 to 30 wt.% amylose. For some cereal types, such as barley,

maize, millet, wheat, milo, rice and sorghum, varieties are known of which the starch granules nearly completely consist of amylopectin. Calculated as weight percent on dry substance (wt.%), these starch granules contain more than 95%, and usually more than 98% of amylopectin. The amylose content of these cereal starch granules is therefor less than 5%, and usually less than 2%. The above cereal varieties are also referred to as waxy cereal grains, and the amylopectin starch granules isolated therefrom as waxy cereal starches.

In contrast with the different cereals, starch granules of non-cereal starches, such as root and tuber varieties, that (nearly) exclusively consist of amylopectin are traditionally not known in nature. For instance, potato starch granules isolated from potato tubers usually contain about 20% amylose and 80 % amylopectin. During the past 10 years, however, successful efforts have been made to cultivate by genetic modification non-cereals, such as potato plants which, for example in the potato tubers, form starch granules consisting for more than 95 wt.% of amylopectin. It has even been found feasible to produce potato tubers comprising substantially only amylopectin.

In the formation of starch granules, different enzymes are catalytically active. Of these enzymes, the granule bound starch synthase (GBSS) is involved in the formation of amylose. The presence of the GBSS enzyme depends on the activity of genes encoding for said GBSS enzyme. Elimination or inhibition of the expression of these specific genes results in the production of the GBSS enzyme being prevented or limited. The elimination of these genes can be realised by genetic modification of potato plant material or by selection for plants having a recessive mutation, preferably in homozygous form, of said gene. An example of the latter is the amylose-free mutant of the potato (amf) of which the starch substantially only contains amylopectin through a recessive mutation in the GBSS gene. This mutation technique is described in, inter alia, J.H.M. Hovenkamp-Hermelink et al., "Isolation of amylose-free starch mutant of the potato (*Solanum tuberosum* L.)", Theor. Appl. Gent., (1987), 75:217-221" and E. Jacobsen et. al., "Introduction of an amylose-free (amf), mutant- into

breeding of cultivated potato, *Solanum tuberosum* L.,
Euphytica, (1991), : 53:247-253.

Elimination or inhibition of the expression of the GBSS
gene in the plant is also possible by using so-called antisense
inhibition. Genetic modification of for example potato is
described in R.G.F. Visser et al., "Inhibition of the
expression of the gene for granule-bound starch synthase in
potato by antisense constructs", Mol. Gen. Genet., (1991),
225:289-296. By using genetic modification, it has been found
possible to cultivate and breed non-cereal roots and tubers,
for instance potato, yam, or cassava (Patent South Africa
97/4383), of which the starch granules contain little or no
amylose. As referred to herein, non-cereal amylopectin starch
is the starch isolated from non-cereals such as potato tubers
or tapioca and having an amylopectin content typically more
than 90 wt.%, preferably of at least 95 wt.%, and preferably at
least 98 wt.%, or even at least 99 wt.%, based on dry
substance.

Regarding production possibilities and properties, there
are significant differences between amylopectin potato starch
on the one hand, and the waxy cereal starches on the other
hand. This particularly applies to waxy maize starch, which is
commercially by far the most important waxy cereal starch. The
cultivation of waxy maize, suitable for the production of waxy
maize starch is not commercially feasible in countries having a
cold or temperate climate, such as The Netherlands, Belgium,
England, Germany, Poland, Sweden and Denmark. The climate in
these countries, however, is suitable for the cultivation of
potatoes. Tapioca starch, obtained from cassava, may be
produced in countries having a warm and moist climate, such as
is found in regions of South East Asia and South America.
The composition and properties of root and tuber starch, such
as amylopectin potato starch and amylopectin tapioca starch,
differs from those of the waxy cereal starches. Amylopectin
potato starch, for example has a much lower content of lipids
and proteins than the waxy cereal starches. Problems regarding
off taste, odour and foaming, which, because of the lipids
and/or proteins, may occur when using waxy cereal starch
products (native and modified), do not occur, or occur to a

much lesser degree when using corresponding amylopectin potato starch products.

Furthermore, in contrast to the waxy cereal starches, amylopectin potato starch contains chemically bound phosphate groups. As a result, amylopectin potato starch products in a dissolved state have a distinct polyelectrolyte character. In the present invention non-cereal amylopectin starch and non-cereal amylopectin starch derivatives are applied in expanded food products. In relation to the same products based on other starches, the products based on non-cereal amylopectin starch show very good expansion properties. In some cases unmodified non-cereal amylopectin starch, such as for example derived from potato, even outperforms traditionally applied modified waxy cereal starch derivatives.

In one embodiment of the present invention unmodified, native non-cereal amylopectin starch, preferably derived from potato, is used in expanded products. The unmodified starch may or may not be pregelatinised by drum drying, spray cooking, spray drying, extrusion or heating in aqueous alcohol.

In a further embodiment the application of non-cereal amylopectin starch derivatives in expanded products is provided. The starch derivative may or may not be a cold water swellable derivative obtained using the methods described above.

The starch derivative may be a cross-linked starch, wherein said cross-linking is achieved by using sodium trimetaphosphate, phosphorus oxytrichloride or adipic anhydride, using for example a method known in the art. These cross-linking agents are most suitable for use in the food industry but others can also be contemplated.

The starch may be stabilised by treatment with acetic anhydride, vinyl acetate, or comparable agents. The starch may be stabilised by hydroxypropylation. Stabilisation by hydroxyalkylation of starch is, for example obtained with reagents containing a halohydrin, or an epoxide group as reactive site. The addition of hydroxypropyl groups is generally performed in aqueous suspensions of starch using propylene oxide, under alkaline conditions. The starch may also be derivatised by a combination of cross-linking and

stabilisation. Cross-bonding and/or stabilising reagents are in general reacted with starch under alkaline conditions. Suitable alkali materials are: sodium hydroxide, potassium hydroxide, ammonium hydroxide, magnesium hydroxide, sodium carbonate and trisodiumphosphate. Preferred are the alkali metal hydroxides and carbonates, most preferred are sodium hydroxide and sodium carbonate. Sometimes salts are added as to prevent swelling under alkaline reaction conditions. Preferred are sodium chloride and sodium sulphate.

The invention is further described in the detailed description and the examples therein without limiting the invention.

Detailed description

Example 1

Method for nut coating

Preparation of dry mix

A mixture is prepared of a native starch, here 400 g native potato starch, and a cold water swellable (pregelatinised) starch, here 200 g cold water swellable adipate acetate based on waxy maize starch. Herewith a dough coating is prepared of:

400 g starch mixture
80 g powdered sugar
10 g salt
10 g glutamate
water

Processing

Coat 400 g shelled peanuts in an Erweka AR 400 rotating coating pan (30 rpm, inclination of about 30°)

Pre-coating

During this experiment the nuts are kept rotating. 8 g of water is sprayed on the nuts. The nuts are dusted with a malto
5 dextrin such as AVEBE's Paselli SA 2, Paselli MD 10, Paselli MD6 and again 10 g of water are sprayed on. Immediately afterwards 65 g of coating mix is dusted on the nuts.

Main coating

10 The main coating is performed in several steps according to a scheme for example as below.

step	spray with water (in g)	dust with coating mix (in g)
1	15	25
2	15	40
3	20	60
4	10	40
5	10	40
6	20	40
7	10	50
8	20	40

15 Final coating and processing steps

The nuts are dusted with 15 g of coating mix. Rotating is maintained for about 10 minutes.

20 Frying

The coated nuts were fried in oil at 155-160 °C for 5 minutes.

The cooled nuts were evaluated for organoleptic features. The
25 volume of 200 g of coated nuts was measured in 1 L cylinder. The results are summarised in table 1, where example 1 is compared with examples 2 - 4.

Example 2

In example 2 potato starch was exchanged for amylopectin potato starch. The results are summarised in table 1.

Example 3.

Example 3 is a repetition of example 2 except that the cold swellable adipate/acetate based on waxy maize starch has been replaced by a none modified cold swellable waxy maize starch. The results are summarised in table 1.

Example 4.

Example 4 is a repetition of example 3 except that the cold swellable waxy maize starch has been replaced by a cold swellable amylopectin potato starch. The results are summarised in table 1.

Table 1.

Example nr	native starch	cold swellable starch		Crisp	Expan- sion	Volu me ml
		starch	modifica tion			
1	PS	WMS	Adipate/ acetate	4	6	550
2	APS	WMS	Adipate/ acetate	6	7	620
3	APS	WMS	none	5	6	520
4	APS	APS	none	8	8	650

Several conclusions can be derived from examples 1 - 4 and Table 1.

- changing the native starch from normal potato starch to amylopectin potato starch improves expansion and crispiness.

- upon changing the cold water swellable starch from modified waxy maize starch to unmodified waxy maize starch expansion and crispiness go down
- changing the cold water swellable starch from unmodified or modified waxy maize to unmodified amylopectin potato starch improves the expansion and crispiness.
- it is possible to avoid the off-taste brought in by the waxy maize starch by replacing it with a non-cereal amylopectin starch.

Example 5

Method

A dough was prepared of 14.4 kg of whole potato flakes (Rixona, German flakes), 5.80 kg of pregelatinised potato starch (with a moisture content of 9.3%), small components (0.39 kg of salt, 0.28 kg of sodium bicarbonate, 0.11 kg of citric acid, 0.14 kg of acid sodium pyrophosphate, 0.19 kg of sunflower oil, 0.11 kg lecithin) and 14.5 kg of water. The blend of dry ingredients is mixed for 30 seconds on low speed (52 rpm) in a high speed mixer. Oil and lecithin are added and mixed in for 2 minutes at high speed (104 rpm). Water is added and mixing is continued for 2.5 minutes. The dough is left to rest for 60 minutes. A biscuit line is fed with dough and the thickness of the dough is brought down to 0.6 cm. Round pieces are cut and dockered. The products are baked in a continuous oven with two zones (front: 215 °C, back: 185 °C) for 2.8 minutes.

The final products were evaluated for expansion, hardness in bite and crispiness. The results are summarised in table 2.

Expansion measurement

The weight of the amount used to fill a 2 l measuring cylinder with baked snacks was determined. The results were expressed as the volume which is occupied by 200 g.

Example 6.

In example 6 the instant starch was derived from waxy maize starch. It proved very hard to prepare a workable dough from this starch. The results are summarised in table 2. It shows clearly that waxy maize starch induces less expansion in this application.

Example 7.

In example 7 the instant starch is a medium cross-linked potato starch derivatives. This example clearly shows that regular potato starch derivatives give low expansion values. The product is very hard also, which leads to a low appreciation.

Example 8.

In example 8 the instant starch is a low cross-bonded (STMP) amylopectin potato starch derivative. The results clearly show that this product has very good expansion characteristics and good crispiness.

Example 9.

In example 9 the instant starch is a medium cross-bonded amylopectin potato starch adipate/acetate. It can be seen that the food characteristics are still satisfactorily but less than the product from example 8.

Example 10.

In example 10 the starch derivative dosage is raised 50 % as compared to example. The resulting product has very good characteristics.

Example 11.

Example 11 is a repetition of example 7 except that a 40 % extra dosage of water has been added. This example shows that it is possible to obtain higher expansion values with regular starch derivatives, although the expansion is still not as high as with amylopectin potato starch derivatives and the final product is harder. A 40 % extra dosage of water is however in most cases not appreciated. When frying follows extrusion the fat will deteriorate more rapidly and in other processes more energy has to be applied in order to get the same dry crispy product.

Table 2.

Example nr	5	6	7	8	9	10	11
instant starch	APS	WMS	PS	APS	APS	APS	PS
modification	none	none	crossl.	crossl.	crossl. stab	crossl. stab.	crossl.
Level			medium	low	medium	medium	medium
Reagent			STMP	STMP	adip/ac	adip/ac	STMP
						*	**
Expansion ml	2410	1880	1610	2530	2170	2550	2100
hardness	2	2	4.5	2	2	2	3.5
crispiness	5	5	1	5	5	5	5

STMP= sodium trimetaphosphate, adip/ac = adipate/acetate

*= 1,5 fold dosage of starch, **= 40 % extra water dosage

New claims

1. A method for obtaining an expanded foodstuff having improved expansion characteristics, comprising the preparation of a composition at least comprising a non-cereal amylopectin starch, wherein said starch has an amylopectin content of at least 90 weight percent based upon dry substance, heating at least part of said composition to a temperature above its glass transition temperature and letting it cool to a temperature below said glass transition temperature.
2. A method according to claim 1 wherein said composition is a dough.
3. A method according to anyone of claims 1 or 2 wherein said starch is derived from a potato.
4. A composition for use in preparing an expanded foodstuff, said composition at least comprising a non-cereal amylopectin starch.
5. A composition according to claim 4 wherein said starch has an amylopectin content of at least 95 weight percent based on dry substance.
6. A composition according to claim 4 or 5 wherein said starch is derived from a potato.
7. A composition according to anyone of claims 4 to 6 wherein said starch is cross-linked.
8. A composition according to anyone of claims 4 to 7 wherein said starch is stabilised.
9. An expanded foodstuff at least comprising a non-cereal amylopectin starch.
10. An expanded foodstuff according to claim 5 wherein said starch has an amylopectin content of at least 95 weight percent based on dry substance.
11. An expanded foodstuff according to claim 5 or 10 wherein said starch is derived from a potato.

Now page 2

12. Use of a non-cereal amylopectin starch for the preparation of an expanded foodstuff.
13. Use according to claim 12 wherein said starch is modified.
14. Use according to claim 12 or 13 wherein said foodstuff is a snack.
- 5 15. Use according to anyone of claims 12 to 14 wherein said foodstuff comprises a coating.



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ABSTRACT

The invention relates to a composition for use in preparing an expanded foodstuff such as snacks, said composition comprising at least a non-cereal amylopectin starch. It is a further object of the present invention to provide a method for obtaining an expanded foodstuff having improved expansion characteristics. Said composition, such as dough, at least comprising a non-cereal amylopectin starch, such as that isolated from potato tubers or tapioca. The preparation is carried out by heating at least part of the composition to a temperature above its glass transition temperature and letting it cool to below said glass transition temperature.

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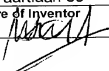
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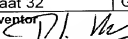
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